

---

# WHAT DO WE KNOW?

---

# WHAT DO WE NEED TO KNOW?

## The State of Research On Work, Employment and Climate Change in Canada

*June 7, 2010 York University*

**With support from:**

Canadian Institutes of Health Research (CIHR)  
Natural Sciences and Engineering Research Council of Canada (NSERC)  
Social Sciences and Humanities Research Council (SSHRC)

## **PROGRAM**

### **Introduction**

STEPHEN McBRIDE, Panel Chair  
Simon Fraser University

### **Overview: International Perspectives and Canadian Contributions**

CARLA LIPSIG-MUMMÉ  
*York University*

### **The Energy Sector**

JOHN CALVERT & MARJORIE GRIFFIN COHEN  
*Simon Fraser University*

### **The Tourism Sector**

STEVEN TUFTS  
*York University*

### **The Postal Services Sector**

GEOFF BICKERTON  
*Canadian Union of Postal Workers*

### **The Transportation Equipment Sector**

JOHN HOLMES  
*Queen's University*

### **Conclusion**

CARLA LIPSIG-MUMMÉ  
*York University*

# OVERVIEW: CANADIAN RESEARCH AND INTERNATIONAL PERSPECTIVE

CARLA LIPSIG-MUMMÉ

Director, 'What do we know?' A Knowledge Synthesis Project<sup>1</sup>  
York University

*We have options, but the past is not one of them.*<sup>2</sup>

## Introduction

In Canada, climate change<sup>3</sup> is changing what we produce and where we are able to produce it.<sup>4</sup> Employment and employment tenures, regulatory regimes, skill demands and infrastructure, are struggling with the flow-on effects. Not all regions, however, are affected similarly. And while international research argues for 'bringing the state back in'-- the pivotal role of interventionist governments to create active labour market pathways, such is not the case of Canada. Canada poses an unusual challenge for researchers and labour market actors in the struggle to slow global warming. Almost alone among developed countries, Canadian national policy 'has remained largely dormant on the national scale.'<sup>5</sup> Despite our growing concern about climate change, and the vast amount of research on the topic produced around the world, research on the impact of climate change for employment and its flow-on to education and training, health, and infrastructure in Canada has been fragmented, underdeveloped, and too often invisible in the arena of public debate. There is pressing need to evaluate what we know and what we need to know, in order to address the question of what we need to do.

*What do we know? What do we need to know?* is a knowledge-gathering and knowledge-assessing project, the first national project to be funded on the climate change/work relationship in Canada. It has three objectives:

1. Assess extant research on the Canadian work/climate change relationship
2. Identify gaps in the research

---

<sup>1</sup> Funded by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council and the Social Science and Humanities Research Council of Canada. Grant # 607-2008-0002

<sup>2</sup> Sauchin, D. and S. Kulshreshtha, in Lemmen, D.S., F.J. Warren, J. Lacroix, E. Bush eds. (2008). "From Impacts to Adaptation: Canada in a Changing Climate 2007." Government of Canada, Ottawa: 296.

<sup>3</sup> It is understood that there is no consensus in the scientific community about the definition of climate change. By climate change we mean recent changes in climate mostly attributable to human activity

<sup>4</sup> Lemmen, D.S., F.J. Warren, J. Lacroix, E. Bush eds. (2008). "From Impacts to Adaptation: Canada in a Changing Climate 2007." Government of Canada, Ottawa

<sup>5</sup> [www.climaticanalysis.org](http://www.climaticanalysis.org), 'Assessing National Climate policy', Nov. 2008-February 2009.

3. Provide Canadians with tools to re-enter the world debate over strategies to slow climate warming.

Today's *Overview* is meant to do two things:

- Introduce the international research that Canadian research draws on and contributes to;
- Introduce *What do we know? A Knowledge Synthesis Project* as a whole.

### **I. International Research and Canadian Research**

By 2008, studies of the threats, opportunities and adaptive pressures of climate warming for employment were growing in number, and were being debated for policy take-up nationally and regionally, in the European Union, Australia, the United States, the United Kingdom, Germany, Argentina and elsewhere. But, not in Canada. In 2009 an International Labor Organization study observed that environmental *policy* still generally failed to consider employment, and that most studies of the threat that climate change posed to livelihoods focused on the poorest countries and regions, destruction of traditional communities, and the need to develop defensively adaptive capacities.<sup>6</sup> The authors of Canada's influential five-year synthesis of Canadian climate change research, *From Impacts to Adaptation: Canada in a Changing Climate 2007*, observed cautiously in 2008: 'Although adaptation processes are not well understood, institutions and civil society will play a key role in mobilizing adaptive capacity'.<sup>7</sup>

**Five themes emerge in international research concerning the future of work as the climate warms. They are each relevant to Canadian policy, research and action.**

**Theme 1** emerges from climate scientists who draw attention to the lack of collaboration, even dialogue, between climate science and social science. 'Social climate scientists' call for **linking climate science and social science**, in order to create effective, timely and active social policy response to climate warming<sup>8</sup>. **We found very few studies of Canada in which climate science and social science worked together.**

**Theme 2** focuses on policy integration, and has developed principally in the European Union. A landmark EU study (2007, 2009) concludes that a **double policy integration** is necessary: transitional policies for employment and HRM need to be integrated into environmental policy. The suite of social welfare

---

<sup>6</sup> Belèn-Sanchez, A. and P. Poschen (2009) 'The Social and Decent Work Dimensions of a New Agreement on Climate Change', International Labor Organization Policy Integration Department: 10.

<sup>7</sup> Lemmen et. al. op.cit : 7.

<sup>8</sup> Lynch, A.H., L. Tryhorn, and R. Abramson. (2007). "Working at the boundary: facilitating interdisciplinarity in climate change adaptation research," *Bulletin of the American Meteorological Society* 89, 169-179. Van Aalst, M.K., T. Cannon, I. Burton. (2008). "Community level adaptation to climate change: the potential of participatory community risk assessment," *Global and Environmental Change* 18: 165-179.

policies in developed economies need to be integrated to take account of the geographic, community and employment dislocation that transitioning to a green economy will entail. Without this double integration, there is a risk that attempts to implement policy to slow climate warming will fail<sup>9</sup>. **At neither provincial nor federal level has policy integration, or double policy integration, crystallized.**

**Theme 3** explores the parameters of, and need for, **strong, creative, interventionist states**, for job creation, incubation of green technologies, training for green competencies, crafting and realizing climate policy that will slow climate warming. "Under most scenarios of climate policy to slow global warming, job losses and job movement will be considerable, projected job gains depend on politics, and interventionist government policies are essential."<sup>10</sup> Studies in Australia, the EU, Germany, UK foreground the need to 'return to the state'<sup>11</sup>. **Canadian studies are varied in this regard, but both business and labour stakeholders identify a crucial role for governments at all levels with optimism that investment will produce large numbers of 'green jobs.'**

**Theme 4** looks at **transitional strategies for greening economies** at local, regional, national and transnational levels. Very recent case studies in Germany and Argentina show how creating local economy circuits and linking these to environmental education at all educational levels, draws local business and local government into a widening circle of transition to a lower-carbon economy<sup>12</sup>. In North America and Australia, optimism about a 'green gold rush', the number of jobs that might be created as the economy shifts to new energy sources, has taken centre-stage in labour market strategies<sup>13</sup>. In the EU, the importance of analyzing job movement by economic sector, proves crucial to nuancing the optimism of the green jobs-creation perspective. **Canadian research on transitional strategies is sparse. Research on localizing economies is flourishing, but fragmented.**

**Theme 5** focuses on the range of ways in which **workers and workplace organizations can play an active, adaptive role in greening the economy and the labour process**. In the social partnership countries in the EU, and in Australia, strategy research on the ways in which workers and their

---

<sup>9</sup> Dupressoir, S. et al. (2007) "Climate Change and Employment. Impact on employment of climate change and CO2 emission reduction measures in the EU-25 to 2030," European Trade Union Congress, SYNDEX, ISTAS, Social Development Agency, Wuppertal Institute: 3. Syndex et al. (2009), "Les dérèglements climatiques, les nouvelles politiques industrielles et les sorties de crise".

<sup>10</sup> Hatfield-Dodds, S., G. Turner, H. Schandl and T. Doss. (2008). 'Growing the green collar economy: Skills and labour challenges in reducing our greenhouse emissions and national environmental footprint'. *Report to the Dusseldorf Skills Forum*, CSIRO Sustainable Ecosystems, Canberra.

<sup>11</sup> Cf. Australian Manufacturing Workers' Union (2008) 'Making our Future: Just Transitions for Climate Change Mitigation'. Sydney.

<sup>12</sup> Marini, Victoria (2010) 'Balance Cero: A collaborative, environmental and digital plan to reduce global warming', La Punta: Universidad LaPunta. Kaminski, P. (2009) 'Ecology and Sustainability at the Tulla High School, Rastatt', *Education for Sustainability International Conference*, Karlsruhe, Germany, Sept. 30-Oct.2,2009. Marini, M.V. (2009) 'Environmental Protection through Information Technology: a Model from Argentina'. *Education for Sustainability International Conference*, Karlsruhe, Germany, Sept. 30-Oct.2,2009

<sup>13</sup> ACTU, Australian Conservation Foundation (2008) 'Green Gold Rush: How an Ambitious Environmental Policy can make Australia a Leader in the Global Race for Green Jobs', Melbourne (Australia). Apollo Alliance (2008), "Green Collar Jobs in American Cities", Oakland (Calif).

organizations engage in greening the labour market, tends to accord a lead role to the labour party and the state. In the collective bargaining regimes of Canada and the US, agents and drivers of adaptation focus on the workplace and collective bargaining, and tend to be identified with the unions and their members. 'Greening the economy' comes to be seen as a process, a direction, and a space for active engagement by individuals, labour market organizations, businesses, communities and governments. **Canadian labour's research and position papers have gained international prominence on this theme. What is emerging is a worker-centred approach to adapting the organization of work in order to transition existing jobs to greener methods and make work and workplaces environmentally responsible.**

These five research themes, culled in the main from international research carried out in the past five years, provided us with our initial 'leads' in structuring the *What do we know?* knowledge synthesis.

## **II. The *What do we know* Knowledge Synthesis Project**

In late 2008, the three major Canadian research councils funded, for the first time, knowledge-synthesis projects to assess the quality and scope of Canadian research on the societal dimensions of climate change. Among these 'scoping projects', 'What do we know' was the only one to focus on work and employment. This Panel is the first public airing of our research.

As its central question, *What do we know?* asks: *What is the state of our knowledge concerning the complex interaction between climate change, response to climate change, and Canadian work and employment?*

To assess the state of Canadian research, we developed a bibliographic database focusing on economic sectors and their employment futures, and the large socio-economic context which linked Canadian and international research. We gathered information for six economic sectors and for overall social and economic context:

- Energy
- Forestry
- Tourism
- Transportation Equipment
- Postal and Courier Services
- Construction.

Information scientist Elizabeth Perry<sup>14</sup> created a database of selected bibliographic references produced between January 1995 and December 2009. The sources are both conventional peer-reviewed publications, and grey literature. Grey literature is defined as: "Information produced on all levels of government, academic, business and industry in electronic and print formats not controlled by commercial publishing i.e. where publishing is not the primary activity of the producing body"<sup>15</sup> Our reason for including grey literature is that some of the most important research in this field is produced and disseminated as grey literature.

---

<sup>14</sup> Elizabeth Perry, former Chief Librarian, Centre for Industrial Relations and Human Resources, University of Toronto. Founding Editor, *Perry Work Report*.

<sup>15</sup> ".www.greynet.org

The 1349 sources collected are in English and French. They are organized in six categories, according to the type of organization that published them or was responsible for them:

- Scholarly
- Government and para-governmental organizations
- Independent research centres and institutes
- Labour market organizations
- Advocacy groups
- Popular press.

For the material collected as a whole, we asked these questions: *What is the knowledge we have, at this time? Where are the gaps? What do we need to know?* We gave special attention to including documents that are freely available on the web. The purpose was twofold: to make these more accessible; and to draw attention to the extraordinary, creative flow of information that the worldwide web represents. As such, the bibliographic database became a unique tool in social climate change research. It should be noted, however, that the cross-pollination of sources, their publication in several forms simultaneously, and the fluidity of their categorization, made data collection an unusually challenging exercise.

**The bibliographic database is publicly accessible.** We believe it is the largest bibliographic database on Canadian research on work, employment and climate change in existence. Also, the references are abstracted, and the abstracts are becoming available online. Many of the documents can be downloaded.

How does the research project use the bibliographic database? In five ways:

- As the key source of information for the written analysis of what we know about the interactions of climate change, work and employment in Canada;
- As the crucial resource for the Knowledge Synthesis Report that the project produces;
- To give the public free access to a unique depository of analysed information on climate change and work in Canada;
- As the basis for workplace education courses;
- To resource future research projects, such as the 5 year SSHRC funded 'Work in a Warming World'.

The results of analyzing these sources for four of the six economic sectors--energy, transportation, tourism and postal services--will be presented by our panelists today. Construction and forestry sectors have been summarized in the Panel's brochure.

# THE IMPACT OF CLIMATE CHANGE ON EMPLOYMENT IN CANADA'S ENERGY SECTOR

*MARJORIE GRIFFIN COHEN & JOHN CALVERT*

Simon Fraser University

## **What Do We Know?**

Canada's energy sector includes a broad range of different energy sources, technologies, GHG emission impacts and employment arrangements. Fossil fuels such as oil, natural gas and coal still dominate energy production. Canada continues to make significant investments in the further exploitation of these fuel sources, particularly the expansion of the tar sands, as well offshore oil and natural gas. Canada's electricity production is dominated by large hydro with coal, natural gas and nuclear playing a lesser, but still significant, role in some provinces.

Despite the increasing attention given to new sources of renewable energy, including wind, biomass, geothermal, small hydro and solar, large hydro remains the predominant source of renewable electricity – and renewable energy - in Canada. Proposals for expanding the share of renewables in Canada's energy mix tend to focus primarily on further greening the electricity sector. However, thus far, new renewable electricity is still a relatively small contributor to overall energy supplies.

Conventional energy production is very capital intensive, creating relatively few jobs compared with other sectors of the economy. Employment impacts tend to be concentrated in the development and construction of facilities and related infrastructure as well as in the transportation requirements associated with building and servicing energy projects. Upstream manufacturing linkages for materials and equipment, as well as related administrative and technical services, provide additional employment, particularly in Ontario and Quebec. But imports also meet a significant share of the demand for manufactured goods needed in the energy sector.

In virtually all areas of energy development, there are skills shortages and calls for additional training. These shortages cover a wide range of different occupations, from engineers and architects to skilled trades, equipment operators, technicians and even construction labourers. However, skills shortages also vary, both regionally and on the basis of the type of energy produced. While most of the shortages are for jobs in the conventional energy sector, the renewable sector is also experiencing significant shortages of qualified personnel.

Canada's energy policies reflect a lack of national leadership on how best to 'green' the energy sector. In general, federal and provincial governments still plan to rely on traditional energy sources supplemented by continued expansion of the tar sands, construction of additional crude oil pipelines, and the development of unconventional gas (such as tight gas, shale gas and coalbed

methane). The federal government has used its policy tools to reinforce reliance on market forces and the role of private actors to shape energy development and to determine Canada's response to global warming. This approach has been reinforced by the Constitutional role of provinces/territories as resource owners, leading to a patchwork quilt of uncoordinated policies and a continuing reliance on the exploitation and export of fossil fuels. NAFTA and other international trade obligations have reinforced this market friendly approach. As a result, Canada does not have an industrial strategy that would transition the energy sector towards providing more labour intensive, green jobs.

To the extent that there has been some growth in 'green' energy, this has been largely the result of provincial government initiatives and has focused primarily on private sector investment. Other than large-scale hydro projects, this tends to produce fairly limited job growth in this sector. Since most permanent jobs related to 'green' energy are created through the manufacturing of green technology, the focus on increasing the domestic use of this technology through Canadian based manufacturing is crucial. If these technologies are imported (and older brown energy use is reduced), job losses could occur.

In the hydro sector, governments have failed to link their new investments with a comprehensive strategy to strengthen Canada's green energy manufacturing capacity. As new hydro of both conventional and unconventional technologies comes on line, Canada needs to have policies which ensure that these inputs are manufactured here. Unfortunately, growing reliance on private sector development reduces government leverage to encourage domestic production of inputs. International experience indicates that most manufacturing in the renewable energy sector occurs in countries where there is considerable government support (Germany, US (led by states), Spain, India, China). Construction jobs are also important in the green energy sector, but they are not permanent jobs.

The big issue, whenever expansion in green energy production occurs, is the shortage of qualified labour. Jobs in this sector tend to be highly specialized (with the exception of the biomass industry). The conventional energy sector also reports labour shortages, so labour costs are likely to be high for the skilled trades and professional jobs in this area of energy production. The utilities sector is the largest employer of unionized energy sector workers. Most oil exploration and drilling is not organized (except for Hibernia), although unions do represent a significant number of workers in gas distribution. In the energy sector where the industry and labour *will* go is very different from where it *should* go. So, far there are no labour adjustment policies in place to plan for an economy that has an energy sector which differs significantly from the status quo.

### **What Do We Need to Know?**

- 1) There is a wide divergence in the way that 'green' jobs in the energy sector are defined. We need a recognized standard way to count 'green' jobs and specifically a way for this information to be counted by

Statistics Canada by industry. [For example, is nuclear treated as 'green', ditto for run-of-river hydro and large hydro].

- 2) Little accurate data is available on the share of green jobs in the energy sector in Canada. Throughout the world biomass leads the field in creating the most jobs, followed by solar thermal and wind power. In Canada the tendency is for those supporting 'green energy' to dramatically over-state the job creation potential, but we have little hard data on what employment levels are, either in total or by energy source.
- 3) Only within the energy utilities in Canada is the level of unionization high. We need to know the level of unionization in green industries (outside large hydro). Updating statistics on levels of unionization in the energy sector needs to be done.
- 4) We could find no literature on the ownership structure of green initiatives in Canada. In some provinces (such as BC and Ontario) the trend toward 'run-of-river' hydro development has shifted the production of electricity from the utility (owned by the government) to private companies. We need data on the level of domestic vs. foreign ownership. Associated with this, we need a better understanding of the implications of current policies that allow for the concentration of private 'green' production. It is entirely possible that the expansion of private green production could establish monopolies through lack of regulatory control.
- 5) Employment figures for each green sector should distinguish between a) construction; b) manufacturing; and c) on-going energy production. This is not available by energy sector in Canada now.
- 6) We know that the vast majority of workers in the energy sector are male. No data exists on the demographic make-up of the green energy sector, or of other demographic characteristics of the workers (such as level of education, age, and whether they are migrant or domestic workers).
- 7) While labour shortages exist, little is known about the training needs in the green sector in Canada.
- 8) Within the traditional energy sectors, research is needed on how much 'greening' of jobs is feasible.

In light of the diverse character of the energy sector, answering these questions is a major challenge. Moreover, the answer to some of these questions will depend significantly on the policy approach of current and future governments with respect to energy development and conservation.

Given this caveat, we need to know more about the likely pattern of future energy development in Canada and the extent to which it will be shaped by an understanding of the urgency of meeting climate change objectives. We also need to know more about the realistic options that Canada could pursue, assuming federal and provincial governments chose to develop a more activist approach to responding to climate change.

Finally, we need to know what other countries have done in specific sectors to transition to greener ways of producing energy and minimizing its unnecessary use.

## **TOURISM, CLIMATE CHANGE AND WORK: UNEVEN IMPACTS, INSTITUTIONS AND RESPONSE**

*STEVEN TUFTS*  
York University

### **What Do We Know?**

The impact of climate change on tourism related industries occurs within a highly dynamic competitive context of tourism related industrial restructuring and changing labour markets. The rise of 'new' tourisms which reject mass produced packaged holidays results in fewer return visits and increasingly segmented markets. Destinations are forced to innovate endlessly in order to attract an increasingly sophisticated 'post-tourist' whose complex aesthetic demands are met with the ability to virtually explore places prior to visitation. These competitive pressures have led to demands for even greater worker flexibility in industries traditionally based on precarious employment relationships.

This broader context and the complexity of the sector itself makes the relationship between tourism related industries and climate change especially difficult to analyze. First, there is really no such thing as a 'tourism sector', but rather a collection of related industries which operate in areas of tourist origin, destination and the spaces of travel between. Second, not all economic activity in these industries is generated solely by tourism as residents also consume the same services (e.g., food and beverage services, recreation and entertainment services). Third, tourism activity itself is diverse operating at a number of different scales (local versus international) and time horizons (weekend getaways versus extended working holidays). Fourth, the state is implicated in the sector in many ways as a marketer (i.e., place promoter) and supplier of infrastructure (e.g., airports, roads, sewers). Tourism-related industries will remain an important sector of employment and future job growth, now accounting for over 1 in 10 jobs in Canada. It is estimated that these industries will employ over 2 million workers in Canada by 2025 and will continue to serve as an important source of employment for immigrants, women and young workers.

For some time we have known that tourism related activity and climate change are deeply interrelated. Tourism related industries produce significant GHG emissions, mostly related to travel and accommodation. It is estimated that 40%-60% of tourism related GHG emissions in Canada come from air travel. Any steps to greatly reduce GHG emissions through reducing travel between places, inevitably translates into a decline in tourism activity as we currently understand it. At the same time, destinations are greatly affected by global warming (e.g., shorter winter seasons, fire related to drought). The literature exploring the links between tourism and global climate change is now extensive. In fact, the wealth of information has itself become an industry since researchers began to study the issue seriously in the late 1980s. In recent years the IPCC has paid increasing attention to tourism activity and scholars based in Canada have been

at the forefront of this research. Despite the growing number of studies, the impact on employment change is relatively unknown. Employment often remains an *a priori* consideration with little nuance. While employment change is often the justification for such studies and the policy implications of the work, there is little effort to link increasingly sophisticated models exploring the impacts of climate change to changes in levels of employment and the labour process in tourism related industries. Other major areas of agreement in the studies are that: tremendous local variability in impacts and vulnerabilities require local analysis; predictability is limited given the range of climate change scenarios; and climate change will involve 'creative destruction' in tourism-related labour markets rather than the wholesale collapse of the sector.

<b>Selected Characteristics of Tourism Related Employment</b>	2006 Employment (thousands)	Estimated Labour Demand in 2025 (thousands)	Ratio of younger (15-44) to older (45+) workers	% Female	% Born in Canada	Average hourly wage (2006)
<b>Sector</b>						
<b>Total</b>	<b>1,810</b>	<b>2,200</b>	<b>2.9</b>	<b>54.6</b>	<b>79.6</b>	<b>29.2</b>
Transportation	241	301	1.1	29.5	79.5	25.1
Accommodation	232	294	1.9	62.5	77.4	48.5
Food and Beverage Services	926	1,161	4.8	60.1	78.3	33.7
Recreation and Entertainment	372	387	2.7	48.5	87.2	20.2
Travel Services	47	57	2.0	68.2	65.8	34.3

### **What Do We Need to Know?**

As a result of these knowledge gaps, there needs to be a re-centring of employment in our analysis of climate change and tourism. Specifically we require:

- Sophisticated models which are able to translate the impact of climate change to local levels of tourism related and tourism generated employment at local scales;
- In depth qualitative research linking industry mitigation and adaptation practices to changes in labour processes (e.g., the adoption of 'Green Key' certification by hotels) ;
- Specific role tourism related workers and their organizations play (positive) and can play (normative) in climate change mitigation and adaptation; and
- Employment centred adaptation and mitigation policy.

There is a need to work toward a worker centred model of tourism and climate change which examines the impacts on workers and their institutions and the roles they play in mitigating and adapting to climate change in areas of origin and destination. There are, however, challenges to furthering this research. Cited obstacles are the continued lack of interaction among physical and social sciences in tourism related research; the limited research resources invested in the broader question of climate change and tourism; and methodological challenges related to complexity of the sectors involved. Further challenges are broader intellectual trends in tourism studies which have shifted away from political economy approaches and the uneven institutional capacities among tourism related workers to engage in mitigation and adaptation processes.

# THE IMPACT OF CLIMATE CHANGE ON WORK AND EMPLOYMENT IN THE CANADIAN POSTAL AND COURIER SECTOR

*GEOFF BICKERTON, Meg Gingrich & Sarah Ryan*  
Canadian Union of Postal Workers

## What Do We Know?

We know that through the operation of their fleets and facilities postal and courier sector represents approximately one per cent of emissions in advanced industrial countries. Worldwide, the largest segment of the industry, the national postal services, employ more than 5 million people; operate a global network of more than 600,000 post offices and almost one million postal vehicles. The Universal Postal Union estimates that Posts generated at least 26 million tons of CO<sub>2</sub> in 2008 only through the operation of postal vehicles and buildings. A comprehensive study of the energy consumption, waste generation, and pollutant emissions associated with mail in the United States conducted by SLS Consulting Inc. in 2008 found that the four major mail classes of USPS (letters, admail, periodicals and packages) comprise 0.47 percent of the national total of CO<sub>2</sub>-equivalent emissions and 0.6 percent of the nation's energy consumption. This figure does not include the GHG contribution of the courier companies and admail delivery firms. In 2008 Canada Post Corporation reported that it was responsible for GHG emissions of 197 kilotonnes. The Corporate fleet emitted 59 kilotonnes of GHGs and rural delivery contributed 45 kilotonnes.

Greenhouse gas emissions associated with parcel delivery are much greater than those associated with first class letters or the delivery of addressed admail. An American study also found that the greenhouse emissions reported by UPS in its Corporate Sustainability Report were higher by a factor of 3.6 on a per parcel basis than those reported by the USPS. This is due to lack of density and UPS reliance on air transportation.

Canada Post Corporation and most other major service providers in the industry have embarked on major programs designed to lower the GHG emissions associated with their vehicles, facilities, packaging materials and modes of transportation of products. For example in December 2009, at the global climate change conference in Copenhagen, 20 major postal operators, members of International Post Corporation (IPC), collectively committed to reduce their CO<sub>2</sub> emissions by 20% by 2020 (based on 2008 levels). Not surprisingly these actions are also designed to cut costs and increase profits.

In addition to programs to provide more efficient vehicles and facilities there is a growing recognition of the need to re-examine the industry through an environmental lens. Such an examination would include service requirements, delivery modes and mandatory consolidation of delivery in areas of low delivery density.

## **What Do We Need to Know?**

Among the research gaps that emerge from a review of the literature on climate change and the Canadian postal and courier sector are:

1. A comparison of the environmental impact of various types of delivery services such as door to door delivery, centralized delivery to community mailboxes, and picking up mail at post offices in both suburban and rural settings.
2. A comparison of the environmental impact of delivering parcels through the various sectors of the industry including postal services, national overnight courier companies and local same day couriers.
3. The environmental consequences of postal deregulation.
4. The environmental consequences of requiring consolidation of delivery activities in low delivery density areas.
5. The environmental impact of relaxing delivery time requirements for letters. This should include the impact of loss of parcel volumes to the courier industry.
6. The environmental impact of reducing delivery frequency. This should include the impact of loss of parcel volumes to the courier industry.
7. The potential for postal and courier companies to use price incentives to require more environmental practices on the part of customers and suppliers.
8. The environmental consequences of offering additional financial and government services in postal facilities in rural communities.
9. The environmental impact of online or telephone shopping and delivery by the post or courier.
10. The life cycle assessment of the energy requirements and waste produced by all postal and courier products through the entire product cycle including extraction of raw materials, product manufacturing, distribution, use, maintenance/repair and disposal.

# THE TRANSPORTATION EQUIPMENT INDUSTRY

JOHN HOLMES with Austin Hracs  
Queen's University

## What Do We Know?

Although transportation equipment includes aircraft, ships and rail rolling stock as well as motor vehicles, this chapter focuses on motor vehicles and especially on automobile and light-duty motor vehicles (NAICS 3361) and motor vehicle parts (NAICS 3362). The automobile industry is a key sector of the Canadian economy and is heavily concentrated in southern Ontario. Historically, it has accounted for over 10 percent of Canada's manufacturing GDP, almost one-third of all manufacturing exports and at the peak in the late 1990s directly employed over 150,000 workers with many other indirect jobs reliant on the industry.<sup>16</sup> For over four decades, the automobile industries in Canada and the United States have been fully integrated. During the 1980s and 1990s the industry in Mexico also became integrated into a continent-wide automotive production and sales system.

As a recent report observed "rightly or wrongly, the auto industry has been singled out as a primary "culprit" in climate change debates and politicians have seized on measures affecting this industry as the centre-piece of their climate change proposals."<sup>17</sup> Like all manufacturing processes, the production of transportation equipment (motor vehicles, aircraft, shipping and rail) contributes in some measure to greenhouse gas (GHG) emissions. Automakers are making efforts to reduce GHG emissions associated with vehicle and parts production.<sup>18</sup> For example, Ford in the revamp of the Oakville Assembly Complex has invested in state-of-the-art technology to capture high octane fuel from the fumes generated in the paint shop and use that fuel to power a fuel cell and reduce reliance on power purchased from the grid. However, the manufacture of passenger vehicles and their components is not a major source of Canada's GHG emissions.

The principal impact of transportation on GHGs comes from the burning of fossil fuels to power transportation. Worldwide, it is estimated that 14 percent of total greenhouse gas (GHGs) emissions are attributable to internal combustion engines in all forms of transport (vehicle, ship, air, and rail). About one-tenth of global emissions are due to passenger motor vehicles and it is estimated that they account for a similar share of Canada's GHG emissions. In short, the major climate change issue associated with the auto industry, is the *use* of motor vehicles (and, we might add, other modes of transportation), not their *manufacture*. In the context of an integrated North American (and global) motor

---

<sup>16</sup> The industry has been wrestling with a major crisis since the mid 2000s which has seen widespread plant closings and a loss of roughly 40 percent of direct automotive employment in Canada.

<sup>17</sup> CAW (2007) *Climate Change and Our Jobs: Finding the Right Balance*. Willowdale: CAW

<sup>18</sup> End-of-life recycling requirements will further help to reduce the environmental footprint of passenger vehicles.

vehicle industry this distinction is important. It means that motor vehicle-related GHG emissions depend on which cars and trucks Canadians drive, not on which vehicles are produced in Canada.<sup>19</sup> Over 85 percent of the vehicles produced in Canada are exported, almost all to the U.S. Similarly, over 80 percent of the vehicles sold in Canada are manufactured elsewhere.<sup>20</sup>

One way to cut GHG emissions would be to drastically reduce motor vehicle usage. Certainly, in high-density urban settings it makes sense to encourage a shift to mass public transit, than continue to rely primarily on private vehicles for urban transportation.<sup>21</sup> This could entail the conversion of some automobile manufacturing plants to produce mass-transit vehicles. However, given the existing built environment in North America which for decades has been shaped by the individual automobility afforded by the individually owned motor vehicle it is likely that the need and demand for automobiles will continue well into the future. Therefore, the challenge for the motor vehicle industry lies in developing new technologies that will reduce the environmental footprint of individual passenger vehicles, by improving fuel efficiency and developing alternative, less-polluting fuel technologies.

The United States recently adopted nation-wide standards to limit GHG emissions and increase the fuel efficiency of the new vehicle fleet after more than two decades of inaction. Canada has announced that it will adopt the same mandatory standards. Incremental improvements in fuel efficiency can be achieved from existing gasoline-fired internal combustion engine technology, through the use of lighter materials, the development of more efficient engines and transmissions and advanced electrical systems. A range of alternative fuels and fuel systems which emit less GHGs are also being developed including: clean diesel engines; biofuels, such as ethanol; hybrid power systems which combine an electric motor with a gasoline engine; all-electric vehicles; and, hydrogen-based fuel cells, which convert hydrogen into electric power while producing virtually no pollution. Media discussions of fuel-efficiency gains usually focus on the hybrids, but wider adoption of more mundane clean-technology packages such as variable speed transmissions and clean diesel, many of which are already available and in wide-spread use in Europe and Japan, will be critical.

---

<sup>19</sup> Of course, the emissions of vehicles produced in Canada and exported still contribute to global climate change, irrespective of where they are driven.

<sup>20</sup> The first measure, contained in the Energy Independence and Security Act of 2007, would have increased fleetwide fuel economy to at least 35 miles per gallon (mpg) by 2020. This standard was strengthened in May 2009 through a new program that established national harmonized fuel economy and greenhouse gas tailpipe standards. Under the latter program, the new passenger vehicle fleet will achieve, on average, 250 grams of CO<sub>2</sub> equivalent per mile by 2016. This is roughly equal to 35.5 mpg, requiring new vehicle fleet average fuel consumption to fall by 30 percent from 2012 to 2016.

<sup>21</sup> Recent studies emphasize that one needs to consider the broader urban region since people living in the suburban and outer fringes of regions such as the GTA have much larger carbon footprints than those living in the inner city. Also note the example in the postal services chapter of the carbon impacts of a deregulated and fragmented parcel/package private courier delivery industry

## What Do We Need to Know?

There is an extensive scholarly and scientific literature on the general links between transportation and GHG emissions and on the various technologies being developed in efforts to reduce emissions from internal combustion engines. Relatively little has been written regarding the impacts of climate change on employment and skills requirements in the transportation equipment industry. At best, what is available provides broad-brush estimates of employment change.<sup>22</sup> Although few in number, the consensus in these reports is that neither incremental efficiency improvements nor longer-term technological changes in response to climate change concerns threaten the viability of the motor vehicle industry for the foreseeable future. They argue that compliance with government regulations with regard to fuel efficiency and GHG emissions will involve adding *more* content and value to automotive production, content which, in turn, should require more engineers and workers to produce. In short, and other things being equal, addressing climate change concerns should create more rather than fewer automotive jobs.<sup>23</sup> As one study notes “Re-engineering the U.S. automobile fleet to use energy more efficiently will require new investments in advanced technology, increasing demand for skilled labor. Instead of presenting a threat to the auto industry, reigning in reliance on oil and cutting pollution from fossil fuels can demonstrably create jobs, accelerate innovation, and increase demand for advanced manufacturing.”<sup>24</sup>

Even if one accepts the argument that improving the fuel economy and reducing the GHG emissions of vehicles will create more jobs, a lot more detailed research is still required to assess the impact of green policies on employment trends and skill requirements in the automotive industry. For example, what specific new engineering and manufacturing skills are required to develop and work with some of the more radical new automotive powertrain technologies such as all-electric or hydrogen fuel-cells? How do these skill requirements mesh with other skill needs associated with a shift towards increased integration of mechanical, electrical and software engineering? Which nations and/or regions will most likely capture the jobs and economic benefits associated with the shift to a more fuel-efficient North American vehicle fleet? For example, although the technology for lithium-ion batteries used in plug-in hybrids and electric vehicles was largely developed in North America, production is currently dominated by Japan, China and Korea.

As the CAW Discussion Paper observes “We need to carefully analyze how proposed measures (such as regulated improvements in vehicle fuel efficiency)

---

<sup>22</sup> For example, *Climate Change and Employment*. European Trade Union Confederation (ETUC); CAW (2007) *Climate Change and Our Jobs: Finding the Right Balance*. Willowdale: CAW; A. Baum and D. Luria (2010) *Driving Growth: How Clean Cars and Climate Policy Can Create Jobs*. Report for NRDC/UAW/CAP.

<sup>23</sup> Of course, all other things are never equal. For example, in the 1990s substantial increases in labour productivity in the automotive industry greatly increased output with only modest increases in employment.

<sup>24</sup> A. Baum and D. Luria (2010) *Driving Growth: How Clean Cars and Climate Policy Can Create Jobs*. Report for NRDC/UAW/CAP.

will affect Canada's auto industry, and seek ways of supporting and strengthening the fight against climate change that also strengthen (rather than undermine) this crucial sector of our economy."

# THE FORESTRY INDUSTRY

JOHN HOLMES with Austin Hracs  
Queen's University

## What Do We Know?

Historically, the forest products industry has been one of Canada's leading manufacturing sectors and its largest net exporter. It has been a major component of the industrial structure and employment base in regions across the country but especially in Québec, northern Ontario, and British Columbia. In 2009 it accounted for 11.1 percent of manufacturing GDP, exports of \$23.6 billion and direct employment of 238,200.<sup>25</sup> Workers in close to 200 communities across Canada are directly dependent on forest products for their livelihood.

Canada's forest products sector has undergone major structural changes since 2003 due to: a general downturn in demand for structural lumber; the persistent high value of the Canadian dollar against the US dollar; increased competition from overseas producers; and, as a result of the recent Great Recession, a collapse in US housing starts and a significant decline in the demand for paper used in advertising. The result has been a significant downsizing of Canada's forest products sector's workforce. Over the past five years, the sector has lost in excess of 100,000 jobs. Transitioning displaced workers from an ageing workforce is a major challenge facing the industry.<sup>26</sup>

The forest sector consists of several broad subsectors: primary forestry activities including harvesting (logging); woodlot management and silviculture; solid wood processing in sawmills to produce lumber, shakes and shingles, wood chips, and pulp-related materials; the pulp and paper subsector producing products such as pulp, newsprint, printing papers, packaging papers and paperboard as well as value-added paper products like tissue, napkins, and other consumer paper products; and, the manufactured wood products subsector producing commodities such as dimensioned lumber and panels as well as the higher value-added engineered products such as doors, windows, kitchen cabinets, manufactured housing and flooring. Here the focus is on the impact of climate change mainly on the first three of these subsectors.<sup>27</sup>

Forests act both as a carbon sink and a carbon source which means that they are a key element in the global carbon cycle which helps to regulate climate.

---

<sup>25</sup> Forest Products Association of Canada (FPAC) *Key Economic Facts – Canada's Forest Products Industry (2009)*

<sup>26</sup> R.A. Malatest and Associates (2010) *Analysis and Assessment of Labour Market Transition Programs for Laid-Off Forest Products Workers*. Report for the Forest Products Association of Canada (FPAC).

<sup>27</sup> Note the numerous links between the forestry sector and other sectors in our broader study e.g. in the postal sector the link between advertising flyers and the production of paper; in the construction sector the increased use of engineered wood products; in the energy sector the move to toward biomass energy and the development of biorefinery-pulpmills.

Forests store large amounts of carbon in the trees and soil by removing carbon dioxide, the major greenhouse gas (GHG), from the air and storing the carbon as biomass (wood, leaves and roots). When trees are harvested, some carbon is released through soil disturbance and the decay of waste left on logging sites. However, if the trees are processed into solid wood products, the latter not only continue to store carbon, but also generate far fewer GHGs in their production than do other common building materials like concrete, brick, glass and steel.<sup>28</sup> Only when wood products are incinerated or decompose do they release their carbon into the atmosphere. A significant volume of logs is exported to the United States and Asia to be processed into solid wood products. A recent pamphlet argued that in the overall value chain, the amount of carbon generated when logs are exported for processing rather than being processed domestically rises by over 50% due to the GHG's generated by the extra transportation required.<sup>29</sup>

Some carbon is emitted slowly back into the atmosphere from decaying trees. Forest fires cause rapid and significant emissions of carbon dioxide and the more potent GHGs methane and nitrous oxide. These removals and emissions are not determined solely by natural processes—forest management activities such as harvesting, tree planting, and efforts to fight fires and insects all have a significant impact.

Changes in forest carbon balances, whether from human or natural processes, contribute to climate change by altering the amount of carbon dioxide in the atmosphere. In turn, a changing climate affects forest carbon storage. For example, a warmer climate can increase the rate of carbon sequestration by speeding up the growth of vegetation. However, at the same time climate warming is likely to significantly reduce carbon storage by accelerating decomposition and increasing the risk of forest fires and insect infestations. For example, as a result of mild winters over the last decade it is estimated that the severe mountain pine beetle infestation in central British Columbia has killed over a billion trees. These dead pine trees represent a huge source of future GHG emissions since much of their stored carbon will be released back into the atmosphere as they decay.

Recently, much attention has focused on wood-fired energy generation. Many forest product mills already have co-generation projects which burn waste wood fibre to produce electricity but there are now planned projects to build large wood-fired electrical generating plants in BC and to build bio-refineries to produce biodiesel from wood in Québec. Wood-fired bioenergy provides an alternative revenue stream for forest industry firms and is promoted as so-called green energy since. Although GHGs are released when wood is converted to energy, it is argued that if new trees are planted eventually the carbon sequestered by the new trees will potentially offset such emissions. However,

---

<sup>28</sup> A recent Statistics Canada report noted that wood products manufacturing has the lowest GHG intensity of nine primary material processing sectors Statistics Canada (2009) *Energy and GHG Intensity by Industry, Canada 2004*. However, pulp and paper has a much higher intensity.

<sup>29</sup> United Steel Workers District 3 (2010) *Raw Log Exports: Bad Economics, Bad for the Planet*.

industry-watchers have urged caution before moving to large scale energy generation from biomass.<sup>30</sup>

### **What Do We Need to Know?**

The forest products industry is already facing major labour market adjustment challenges due to the deep structural adjustments that have been underway during the current decade. Existing studies which focus on the forest industry labour market make scant reference to the likely impact that measures to mitigate climate change will have on employment and jobs in the industry.

There are at least two ways in which such impacts will be felt. In the long term, changes in climate will lead to a shift in the geographical range of different forest species and hence the location of commercially viable wood harvesting and processing. Similarly and as already experienced, climate warming is likely to lead to increased risks of forest fires and insect infestations that may also have a significant impact on supplies of wood fibre. While there is a climate science literature which seeks to model likely regional geographical shifts in forest ecologies, the literature is silent on the impacts of such shifts on future patterns of employment.

While traditional wood and paper products producers will remain important for the foreseeable future, new products, methods and processes are transforming the forest products sector. The shift to a “greener” economy will likely have a significant impact on jobs and skill requirements. For example: the development of more sophisticated engineered wood products for building construction; the use of wood as an input for bioenergy generation (either wood-fired electricity generation or biofuels such as clean diesel); and, the use of cellulose fibre in a range of new products. Currently, the forest products sector employs people in a wide range of skilled occupations and professions including machinists, mechanics, electricians, carpenters, steam engineers, millwrights, foresters, forest technicians and technologists, chemists, engineers, biologists, economists, administrators and marketers. These jobs will continue to be required in continued and traditional processing and manufacturing in lumber, panels, pulp and paper. However, the growth in new wood products and processes will generate new skilled employment opportunities.<sup>31</sup>

If managed properly, there has been growing recognition of the potential importance of forests as net carbon sinks and the carbon credits that such sinks represent. In Canada, and especially in British Columbia, there has been increased pressure from alliances of environmental activists and unionized workers in the logging, pulp and paper and solid wood processing industries for a new model of forest management based around management techniques that

---

<sup>30</sup> For example, see B. Parfitt (2010), *Managing BC's Forests for a Cooler Planet: Carbon Storage, Sustainable Jobs and Conservation*. CCPA

<sup>31</sup> R.A. Malatest and Associates (2010) *Analysis and Assessment of Labour Market Transition Programs for Laid-Off Forest Products Workers*. Report for the Forest Products Association of Canada (FPAC).

maximize carbon storage both in the forests and in forest products.<sup>32</sup> Such a management model could go a considerable way to offsetting GHG emissions elsewhere in the economy and at the same time create a stronger, more diversified and more sustainable forest economy. As a recent report from the CCPA concluded “where logging does occur, it is vital that society gets the best possible environmental and economic returns. From a climate change perspective, that means placing carbon storage at the forefront of forest product use.”<sup>33</sup> Moving to such a model will require much more sophisticated forest management techniques and increased employment in silviculture and forest management. Research is required to identify more precisely the impact of such developments on employment trends and skill requirements in the forest products industry.

---

<sup>32</sup> Recently (May 2010) a landmark Canadian Boreal Forest Agreement was co-signed by firms represented by the Forest Products Association of Canada and a number of environmental groups. Under the Agreement FPAC members “commit to the highest environmental standards of forest management” and conservation groups “commit to global recognition and support for FPAC member efforts”. Logging is suspended on nearly 29 million hectares of boreal forest to allow development of conservation plans and the “do not buy” campaigns watched by environmental activist groups will be suspended.

<sup>33</sup> B. Parfitt (2010), *Managing BC’s Forests for a Cooler Planet: Carbon Storage, Sustainable Jobs and Conservation*. CCPA

# THE IMPACT OF CLIMATE CHANGE ON EMPLOYMENT AND SKILLS REQUIREMENTS IN THE CONSTRUCTION INDUSTRY

JOHN O'GRADY

Prism Economics and Analysis

## What Do We Know?

There are two dimensions to the relationship between the construction industry and climate change. The construction industry – or more broadly, the built environment – is an important contributor to green house gas (GHG) emissions. The Commission for Environmental Cooperation estimates that the construction, operation, and demolition of buildings and other structures accounts for approximately 35% of GHG emissions in Canada. One observer noted that: “8,000 architects and 20,000 engineers control most of these processes.”<sup>34</sup> The Intergovernmental Panel on Climate Change has identified changes in the design and operation of buildings as providing the greatest opportunity for reducing GHG emissions.

Twenty-one countries, including most OECD jurisdictions have established at least one green rating system for new construction. The best known green rating system is Leadership in Energy and Environmental Design (LEED). The Canada Green Building Council, which operates the LEED system in Canada, awards various levels of LEED certification to qualified building designs. The Council also administers an accreditation system for design professionals. It is increasingly common for major private and public developers to require designs that are eligible for LEED certification. The re-orientation of building and civil design to LEED and other green rating systems has obvious implications for the skill requirements of design professionals and for the curriculum that supports professional training. By changing the specification of building materials and the way that new buildings are constructed or existing buildings are modified, green rating systems will have an impact on broader employment trends and skill requirements in the construction industry labour force. These implications are largely unexplored in the analytical literature, though there is a growing advocacy literature which purports to estimate the employment implications of green policies. A review of this literature suggests that both scholars and policy makers should treat its conclusions with considerable caution.<sup>35</sup>

---

<sup>34</sup> Peter Busby, “Building Kyoto: The design professions and the construction industry have much to contribute to meeting Canada’s Kyoto commitments”, *Canadian Architect*, January 7, 2002, Retrieved 11 February 2010 from

<<http://www.canadianarchitect.com/issues/story.aspx?aid=1000116244&type=Print%20Archives>>  
<sup>35</sup> These studies often achieve high estimates of the positive employment effects of green policies by using low estimates for wages and salaries, extremely aggressive estimates for employer multiplier effects, and low or zero assumptions for employment displacement effects. See for example, Robert Pollin and Heidi Garrett-Peltier, *Building the Green Economy: Employment Effects of Green Energy Investments for Ontario*, sponsored by Green Energy Act Alliance, Blue Green Canada, and World Wildlife Fund Canada, 2009.

The second aspect of the relationship between climate change and the construction industry is how changes in climate conditions may strain existing infrastructure. Among the potentially profound impacts of climate are its possible effects on sea levels, the stability of the permafrost, the frequency of severe weather conditions, the water table, and natural drainage systems. There is a substantial Canadian and international literature on the potential impact of these consequences of climate change for both buildings and infrastructure. Much of this literature has been collected by the Public Infrastructure Engineering Vulnerability Committee which is jointly funded by Natural Resources Canada and Engineers Canada. The potential labour market, and broader economic, implications of meeting these infrastructure needs has not yet been explored.

### **What Do We Need To Know?**

Among the research gaps that emerge from a review of the literature on climate change and construction industry labour market are:

- the extent to which the design professions have adapted to the professional skill implications of green rating systems which have become increasingly integral to the practice of engineering and architectural design. These new professional skill requirements also have implications for professional licensure systems, continuing professional development requirements, and for university-based professional education standards;
- the need for rigorous and impartial analysis of the impact of green policies on employment trends and skill requirements
- the role of green rating systems and the degree to which appropriate accountability and validation of standards are maintained;
- how the emergence of green construction skills is shaping the emergence of new occupations as well as altering the skill requirements of existing construction industry occupations and further, the implications of these trends for systems of occupational certification; and lastly
- how Canada's response to changing employment and skill requirements compares to developments in other countries.

## SELECTED INTERNATIONAL DOCUMENTS

Barbier, Edward B. April 2009. *Rethinking the economic recovery: A global green new deal*. United Nations Environment Programme . At <http://www.unep.org/greeneconomy/portals/30/docs/GGND-Report-April2009.pdf> .

Barrett, James P. December 2001. *Worker transition & global climate change*. Pew Center on Global Climate Change. At [http://www.pewclimate.org/docUploads/worker\\_transition.pdf](http://www.pewclimate.org/docUploads/worker_transition.pdf) .

Dupressoir, Sylvie et al. 2007. *Climate change and employment: Impact on employment in the European Union-25 of climate change and CO2 emission reduction measures by 2030*. Brussels: European Trade Union Confederation, Instituto Sindical de Trabajo Ambiente y Salud, Social Development Agency, Syndex, Wuppertal Institute. At <http://www.tradeunionpress.eu/Web/EN/Activities/Environment/Studyclimatechange/rapport.pdf>

Fankhauser, Samuel, Friedel Sehlleier, and Nicholas Stern. 2008. Climate change, innovation and jobs. *Climate Policy* 8, : 421-9.

French, Hilary, Michael Renner, and Gary Gardner. 2009. *Toward a transatlantic green new deal: Tacking the climate and economic crises*. Worldwatch Institute, for the Heinrich Boll Foundation. At <http://www.worldwatch.org/files/pdf/Toward%20a%20Transatlantic%20Green%20New%20Deal.pdf> .

Garnaut, Ross. 2008. *Garnaut climate change review. Final Report*. Cambridge University Press. or available at <http://www.garnautreview.org.au/> .

Global Climate Network. 2010. Low-carbon jobs in an interconnected world. London, Global Climate Network. At <http://www.globalclimatenetwork.info/ecommm/files/GCN%20low%20carbon%20jobs%20update%20March%202010.pdf> .

Global Insight. October 2008. *Current and potential green jobs in the U.S. economy*. The United States Conference of Mayors and the Mayors Climate Protection Center. At <http://www.usmayors.org/climateprotection/documents/Green%20Jobs%20FINAL.pdf> .

Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World, UNEP/ILO/IOE/ITUC, September 2008. At [http://www.unep.org/labour\\_environment/features/greenjobs-report.asp](http://www.unep.org/labour_environment/features/greenjobs-report.asp) .

Hatfield-Dodds, S., G. Turner, H. Schandl, and T. Doss. 2008. *Growing the green collar economy: Skills and labour challenges in reducing our greenhouse emissions and national environmental footprint*. Canberra Australia: Dusseldorp Skills Forum. From a link at <http://www.dsf.org.au/resources/detail/?id=112> .

Intergovernmental Panel on Climate Change documents at their website at <http://www.ipcc.ch/index.htm> .

Mattera, Philip. February 3, 2009. *High road or low road? job quality in the new green economy*. Washington D.C.: Good Jobs First. At <http://www.goodjobsfirst.org/pdf/gjfgreenjobsrpt.pdf> .

Olsen, Lene. November 25, 2009. *The employment effects of climate change and climate change responses: A role for international labour standards*. Geneva: ILO. At <http://www.gurn.info/en/discussion-papers/no12-nov09-the-employment-effects-of-climate-change-and-climate-change-responses-a-role-for-international-labour-standards> .

Pollin, Robert, Heidi Garrett-Peltier, James Heintz, and Helen Scharber. September 2008. *Green recovery: A program to create good jobs and start building a low-carbon economy*. Political Economy Research Institute, University of Massachusetts-Amherst, with the Center for American Progress. At <http://www.bluegreenalliance.org/admin/publications/files/0004.4.pdf> .

Stern, Nicholas. 2007. *The economics of climate change: The Stern Review*. London, England: Her Majesty's Stationery Office.  
From links at [http://www.hm-treasury.gov.uk/stern\\_review\\_report.htm](http://www.hm-treasury.gov.uk/stern_review_report.htm)

## SELECTED CANADIAN DOCUMENTS

Conference Board of Canada. 2010. *The economic and employment impacts of climate-related technology investments*. Ottawa, Conference Board. At <http://www.conferenceboard.ca/documents.aspx?did=3586> (free; registration required)

BlueGreen Canada. 2010. *Falling behind: Canada's lost clean energy jobs* . Toronto: BlueGreen Canada. Available from [http://environmentaldefence.ca/reports/pdf/FallingBehindReport\\_FINAL.pdf](http://environmentaldefence.ca/reports/pdf/FallingBehindReport_FINAL.pdf) .

Canadian Labour Congress (CLC/CTC) 2008. *Climate Change and Green Jobs: Labour's Challenges and Opportunities*. Policy paper #9 from the 25th CLC Constitutional Convention, May 26 - 30, 2008. At <http://www.labourcouncil.ca/CLCgreen.pdf> .

Lemmen, D.S. et al. 2008. *From Impacts to adaptation: Canada in a changing climate 2007/ Vivre avec les changements climatiques au Canada : édition 2007*. Ottawa: Government of Canada. Available at [http://adaptation.nrcan.gc.ca/assess/2007/pdf/full-complet\\_e.pdf](http://adaptation.nrcan.gc.ca/assess/2007/pdf/full-complet_e.pdf) (English) or [http://adaptation.nrcan.gc.ca/assess/2007/index\\_f.php](http://adaptation.nrcan.gc.ca/assess/2007/index_f.php) (French) .

National Round Table on the Environment and the Economy. 2010. *Measuring up: benchmarking Canada's competitiveness in a low carbon world*. Ottawa: NRTEE. Available from <http://www.nrtee-trnee.com/eng/issues/programs/climate-prosperity/benchmarking/benchmarking-eng.pdf> .

Pembina Institute and David Suzuki Foundation. 2009. *Climate leadership, economic prosperity: Final report on an economic study of greenhouse gas targets and policies for Canada*. Pembina Institute, David Suzuki Foundation. At <http://pubs.pembina.org/reports/climate-leadership-report-en.pdf> .

Pollin, Robert, Heidi Garrett-Peltier. 2009. *Building the green economy: employment effects of green energy investments for Ontario*. Green Energy Act Alliance, BlueGreen Canada, World

Wildlife Federation. At [http://www.greenenergyact.ca/Storage/25/1722\\_PERI\\_ON\\_Green\\_Jobs\\_Report.pdf](http://www.greenenergyact.ca/Storage/25/1722_PERI_ON_Green_Jobs_Report.pdf) .

Québec. Ministère du Développement économique, de l'Innovation et de l'Exportation 2008. *Pour un Québec vert et prospère: Stratégie de développement de l'industrie québécoise de l'environnement et des technologies vertes*. Gouvernement du Québec. [http://www.mdeie.gouv.qc.ca/fileadmin/contenu/publications/administratives/strategies/quebec\\_vert.pdf](http://www.mdeie.gouv.qc.ca/fileadmin/contenu/publications/administratives/strategies/quebec_vert.pdf) .

Timilsina, Govinda R. 2005 Economic impacts of Alberta's oil sands . Calgary: Canadian Energy Research Institute. At <http://www.ceri.ca/Publications/documents/OilSandsReport-Final.PDF>

***These references have been selected from the full bibliographic database of the project, publicly available at***

***<http://refworks.scholarsportal.info/refshare/?site=010221091228630000/190-94-3NKCK71600614/230331252629520000>***

## PANELISTS

**GEOFF BICKERTON** is Research Director of the Canadian Union of Postal Workers. He is the longtime commentator on national labour issues for Canadian Dimension.

**JOHN CALVERT** (BA, MA Western, PhD LSE) is an Associate Professor at Simon Fraser University in the Faculty of Health Sciences where he teaches public policy. Previous to joining SFU, he worked for seven years for the BC Provincial Government in a variety of Ministries, but principally in the Crown Corporations Secretariat, a central government agency that monitored policy development in BC Hydro. In recent years, his research has focused on energy privatization. His 2007 book, *Liquid Gold*, examines the impact of the Provincial Government's Energy Plan, including how it has enabled private hydro developers to acquire a growing share of BC's water and wind resources. He is a board member of BC Citizens for Public Power, a research associate with the Canadian Centre for Policy Alternatives and book review editor of Just Labour.

**MARJORIE GRIFFIN COHEN** (BA Iowa Wesleyan, MA NYU, PhD York) is an economist who is a professor of Political Science and Women's Studies at Simon Fraser University. She has written in the areas of public policy and economics with special emphasis on issues concerning electricity and energy deregulation, labour, women, international trade agreements, and the Canadian economy. Her most recent publication on energy and the environment is "Electricity Restructuring's Dirty Secret: The Environment." Her most recent books on women are *Public Policy for Women* and *Remapping Gender in the New Global Order*. She was the principal investigator of a just completed a five-year major CURA project entitled "Re-defining Public Services in British Columbia: Challenges to Economic Security and Alternative Possibilities." Professor Cohen has served on several boards and commissions in British Columbia including the Board of Directors of B.C. Hydro and the Board of Directors of B.C. Power Exchange and on the Board of Directors of NewGrade Energy in Saskatchewan.

**JOHN HOLMES** (B.Sc, MA Sheffield, PhD Ohio) is Professor of Geography at Queen's University in Kingston, Ontario, Canada. He served as Head of the Department of Geography at Queen's from 1993-2004 and is Past-President of the union representing academic staff at Queen's. At Queen's, he is affiliated with the graduate Industrial Relations program in the School of Policy Studies and has held visiting appointments at the University of Sussex, University of Wales, Swansea and UWIST and the University of Manchester. In Winter Term 2007, he was the Invited Visiting Professor in the Institute of Political Economy at Carleton University. His primary research interests focus on the contemporary restructuring and reorganization of production and work in North America. Empirical research has focused primarily on the automobile industry, including the automotive tooling industry, and the forest products industry.

**CARLA LIPSIG-MUMMÉ** (BA Brandeis, MA Boston, PhD UMontréal) is Professor of Work and Labour Studies at York University, Canada. She is principal investigator of the Tri-Agency research project *What do we know? What do we need to know?* and principal investigator of the CURA research programme, *Work in a Warming World*. Author of more than 200 publications and conference papers in English and French, her work has appeared in the EU, South Africa, Australia, Canada, the US, New Zealand, France and Russia. Her research focuses on factoring work and employment into the struggle to respond to climate change, the future of work in developed societies, trade unions in a globalising era, regulating professions, emerging labour relations regimes. A social scientist who began her working life as a trade union organiser, Professor Lipsig-Mummé was founding director of York University's Centre for Research on Work and Society (1990-2001) and Monash University's WAGE. She has held professorships at Université Laval, Monash University and Deakin University. She now holds an honorary professorship in political and social inquiry from Monash University and is a member of the Graduate Faculty of the University of Toronto. In 2009, Professor Lipsig-Mummé was invited to submit a report to the Australian Senate's Inquiry on education and training needs, concerning Australia's capacity for training the next generation for a green transition in the national economy. Her research is also used for workplace and union education in a number of countries. A frequent commentator in the media, she was named to *Canadian Who's Who* in 1990.

**STEPHEN McBRIDE** (BSc Lond, MA, PhD McMaster), is the author two prize-winning books *Not Working: State, Unemployment and Neo-conservatism in Canada* (University of Toronto Press 1992) which won the 1994 Smiley prize; and *Paradigm Shift: Globalization and the Canadian State* (Fernwood 2005) which won the 2007 Weller prize; a dozen co-edited books; and seventy articles and book chapters. Recent or forthcoming co-edited volumes include *Relations of Global Power* (University of Toronto Press, 2010), *The OECD and Transnational Governance* (UBC Press, 2008), *International Trade and Neoliberal Globalism: Towards re-peripheralisation in Australia, Canada and Mexico?* (Routledge 2008); and *Neo-liberalism, State Power and Global Governance* (Springer 2007). His current research is focused on the impact of climate change on work and employment, employment policy in the wake of the financial crisis, and international dispute mechanisms and global governance. He is Director of the Centre for Global Political Economy and a member of the Research Advisory Committee for the Canadian Centre for Policy Alternatives in British Columbia.

**STEVEN TUFTS** (BA McGill, MA Queen's, PhD York) is an Assistant Professor in the Department of Geography at York University. Aside from the impacts of climate change on tourism-related employment, his other specific research interests include: labour union renewal in Anglo-America; labour market adjustment in the hospitality sector; the role of student workers in medium sized economies; and the use of strategic research by labour unions in Canada.